Appl. No. 09/877,757
Amdt. Dated: 3/1/04
Reply to Office Action of 12/03/2003

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An improved packaging for establishing optimum atmospheric conditions for respiring produce, comprising:
a non-porous polymeric material;
a set of microperforations on said polymeric material, wherein said set of microperforations are drill holes and based on a number and a size of said microperforations, control and maintain said optimum atmospheric conditions within specified O_2 and CO_2 concentrations for said respiring produce, said optimum atmospheric conditions containing less than about 20.9% O_2 and greater than about 0.03% CO_2 ~~different than ambient air~~, and wherein said set of microperforations are placed in a registered target area on said polymeric material.

2. (Previously presented) The improved packaging material according to claim 1, wherein said polymeric material is selected from the group consisting of polyethylene, polypropylene, polyester, nylon, polystyrene, styrene butadiene, cellophane, and polyvinyl chloride, in monolayers, coextrusions, or laminates.

3. (Original) The improved packaging material according to claim 1, wherein said polymeric material is heat-sealable.

4. (Original) The improved packaging material according to claim 1, wherein said polymeric material has a thickness in the range of 0.4 to 8 mil.

5. (Original) The improved packaging material according to claim 1, wherein said polymeric material provides a total O_2 Flux ranging from 150 cc/day-atm to 5,000,000 cc/day-atm.

6. (Original) The improved packaging material according to claim 1, wherein said polymeric material provides a total O_2 Flux ranging from 200 cc/day-atm to 1,500,000 cc/day-atm.

7. (Original) The improved packaging material according to claim 1, wherein said polymeric material forms a bag.

8. (Previously Amended) The improved packaging material according to claim 1, wherein said polymeric material is a heat sealable film forming a lid.

9. (Original) The improved packaging material according to claim 1, wherein said polymeric material is formed into a semi-rigid container with a thickness greater than 25 mil.

10. (Previously Presented) The improved packaging material according to claim 7, wherein said bag is substantially enclosed with a top seal, a bottom seal, and a pair of side seals, and wherein said registered target area is a small identifiable area within one-quarter distance from said top seal of said bag.

11. (Previously Presented) The improved packaging material according to claim 7, wherein said bag is substantially enclosed with a top seal, a bottom seal, and a pair of side seals, and wherein said registered target area is a small identifiable area within one-third distance from said top seal of said bag.

12. (Previously Presented) The improved packaging material according to claim 1, wherein said registered target area is located in an area that prevents occlusion of the microperforations by product, labels or other packages.

13. (Previously Presented) The improved packaging material according to claim 1, wherein each of said microperforations has an average diameter between 110 and 400 microns.

14. (Previously Presented) The improved packaging material according to claim 1, wherein said polymeric material has a CO_2 transmission rate that is 2.5 to 5.0 times greater than the O_2 transmission rate.

15. (Withdrawn) A produce packaging material produced by the process of:

   a) selecting an appropriate polymeric base material for optimum specified CO_2/O_2 transmission rates based on produce specific O_2 and CO_2 transmission rates and the quantity of said produce;
   b) calculating an optimal number/size of microperforations for said base material, based on produce-specific O2 and CO2 transmission rate requirements, produce weight, and storage temperature;
   c) locating a target area on said base material;
   d) positioning a laser over said target area; and
   e) drilling said microperforations in said target area with said laser.

16. (Withdrawn) The improved packaging material according to claim 15, wherein said laser is a CO_2 laser.

17. (Withdrawn) The improved packaging material according to claim 15, wherein said optimal number/size of microperforations is based on produce-specific O_2 and CO_2 transmission rate requirements, produce weight, and storage temperature

18. (Withdrawn) The improved packaging material according to claim 15, wherein said step of locating a target area uses a sensor.

19. (Withdrawn) The improved packaging material according to claim 17, wherein said sensor is selected from the group comprising a through-beam photoelectric sensor and a photoelectric proximity sensor.

20. (Withdrawn) The improved packaging material according to claim 15, wherein said step of calculating said required O_2 flux by the microperforations is based on the formula :

$Flux_{O2\text{-}MP\ (cc/day\text{-}atm)} = Flux_{O2\text{-}Total} - Flux_{O2\text{-}film}$

Where:

$Flux_{O2\text{-}film}$ (cc/day-atm) = $OTR_{base\text{-}film}$ (cc/m^2-day-atm) x A_S (m^2)

$Flux_{O2\text{-}total}$ = OTR_T cc/m^2-day-atm x A_s (m^2)

And:

$OTR_T = [(M \times RR) / (A_S P (0.21 - IntO_2))] \times 24$ hrs/day

where,

OTR_T	=	total OTR required for the package in cc O_2 / m^2-day-atm
M	=	mass of produce (kg)
RR	=	respiration rate (cc O_2/kg/hr) @ the expected storage temperature
A_S	=	breathable surface area of the package (m^2)
P	=	atmospheric pressure (atm), assumed to be 1
Int O_2	=	desired O_2 atmosphere inside the package stated as a volume fraction (i.e., if the desired O_2 is 8%, the volume fraction is 0.08);

and the value 0.21 represents the volume fraction of O_2 in ambient air.

21. (Previously Presented) The improved packaging material according to claim 1, wherein each of said microperforations has an average diameter in the range between 120-160 microns.

22. (Previously Presented) The improved packaging material according to claim 1, wherein said polymeric material has a CO_2 transmission rate that is 3.4 to 4.0 times greater than the O_2 transmission rate.